Learning Structural Drawing

with Paper Models

Knowledge of seeing, observing, making and transferring

Giacometti said: “Drawing is about everything, that we see, remember, feel, interpret, visualize, study, record, and investigate...drawing is all”. Drawing is about observing, recoding, noting, commenting, and interpreting. It is also about recombining, reinventing, reformatting, reconstructing, researching... Drawing is essential in transforming one dimensional idea into two or three dimensional visuals. Many times, we use drawing to communicate.

Learning hands-on structural drawing with paper models can become a studio practice for learners in fundamental level. First of all, we have to understanding the relative attributes in making structural drawing, the process, the important key points, the magnitudes and activities that promotes seeing, analysis and observation skills. Drawing has to do with a little imagination, some senses, cognitive structure, awareness and visualization. This article demonstrates the integration of two artistic disciplines-drawing and paper modeling which involve with the knowledge of seeing, observing, making and transferring. Most importantly this article is not only based on self findings and experience; but also a summary of efforts contributed from many individuals-my students.

In recent years trying to deliver knowledge to the students on how to produce deliberate structural drawing, more obstacles I have found as one of the classroom participants. The practice by transferring lines on what we see seem arbitrary, inaccurate, out of shape and some are looking flat.

Drawing from the imagination
Students who have not gone for drawing practice, they often draw what they see but the drawing usually reflects on self-understanding. As quoted by Ian Simpson in his writing; “After all, what I can do if I cannot even draw that?” (1992). Real objects (Geometric or Organic) are drawn with distortion, lack of details; some are out of proportion, and some are out of our cone of visions. There are so many books written by several authors and masters teach us to draw with different modes (for example: contour drawing, cross contour drawing or gestural drawing) and usually advise to draw things that we see. Drawing practices such as these- contour line sketching and gesture drawing definitely help and it is true that we need to improve our seeing skills. We need a method and tool to help us to see well.

"Seeing is about observation. Observational skill can be improved if we see what we need to see and to analyze at what we are looking at." (Edward, 1996)

"To learn to draw, we do not have to learn special techniques and develop manual dexterity; you need to learn how to see.” (Simpson, 1992, p. 41)

"The understanding of drawing depends on accepting that it is improbable that several of the cards have small pieces cut out and that they are all really on the same line in space. We have to see the real 'space clues' so your observation can be accurate, and your drawing will be able to recreate the effects you have observed.” (Simpson, 1992, p. 32)

Our drawings will look better if we understand position and placement of the object, its basic shapes, basic forms and even the texture on the subject matter. To achieve accurate drawing, we need a little imagination, to imagine there are small pieces relay in space so we can understand its spatial depth. This is about the understanding of positions and proportions of our subject matter.

**Structural drawing is...**

Structure is the complexity and its opposite is simple components. It builds from shapes, and there is shape within the objects, best known as the ‘skeleton’. Form is the combination of shapes in dimensions, position, and space (South H., 2010)

"Structural drawing: every object in your drawing has structure, and understanding that structure in perspective will greatly enhance your ability to draw the object quickly, accurately and confidently. Structural drawing skills are especially essential to have in architecture, animation and industrial design.” (learn4good , 2010)
“Structural drawing might be produced based in very complete architectural plans or on very quickly prepared
freehand sketches.” (Nevis E., 2006)

“Structural drawing is building a drawing from geometric basic shapes which requires measurement and
proportion before adding the details and shading.” (Watson L., 2005)

Structural drawing is one of the important sections in drawing lesson in order to produce accurate form
and proportionate dimensional drawing. In making hands on structural drawing, there are people who
understand (who get it) and some others do not. As a person who stands in front of the class to deliver, I
realized how often I assume my students are drawing what they see and observe, especially when things
were so obvious and visible to me. Drawing structural objects is more than drawing an object in a
perspective view, sometimes we need to observe and analyse the object with our senses. There is this
basic mental process- the cognitive structure that helps people to make sense of information, gather
process and output information. It is a special tool in our mind that can be developed. Drawing is ‘coding’
which transformed visually from sensory information. Making the paper models stimulate our reflective
awareness and visualization. And with these, we will be able to develop our cognitive structures. We take
in sensory data every walking minute. To be reflectively aware, we need to see and notice thoughtfully
considering the information that we get from all senses- what we see, what we hear, what we touch, how
we taste, and how we smell. In seeing and observation process, we shall not cut off our sensory inputs
because limited data has limited information to process and vice-versa. We shall see and notice what we
are observing by comparing, analysing, organizing information we gather from our sensory information,
knowledge and previous experiences.

We may start off with making simple basic shapes and the basic forms. Then to draw the model in
different view point by rotating it in different angles. We will start to be more concious about what we are
looking at. By rotating the models in our hands we will try to capture every dimensions and sizes.
Following are the examples of the basic forms made with paper.
Examples of paper models in basic forms
Paper is a flexible, accessible, versatile and easy-to-handle medium. Materials we use to treat paper are cutter, glue or adhesive, scissors, tape, compass, darning needle, eraser paper clips, ruler, staple, cutting mat, puncher and et cetera. The outlook of the paper can be changed if we apply one or more than one techniques in treating the paper. Making paper models allow us to see things in details and be more aware of edges of the objects. Before we cut the shape we need to know whether the edges of the objects are in geometrical or in organic shape. We may want to analyse the layers and the ‘bones’ of an object. Building paper model helps us in visualizing the fragmented pieces and cross contour lines in drawing. By imaging the pivoting planes, we can develop our understanding in seeing three-dimensional object and understanding the form of an object. The process of making a piece of paper into a form involves techniques, measurement, materials, senses, imagination and visualization. According to John Montague, each eye perceives the object from a slightly different angle. This gives the brain a strong clue as to the depth of the object. The brain harmonizes both two-dimensional views and creates a three-dimensional view (2010, p.12). When two planes that are perpendicular to the ground plane intersect with one another; they form a corner that is also perpendicular to the ground plane (2010, p.100).
Following picture shows the examples of paper models and drawings:
Examples of structural drawings

The models are not only providing the clues about the size and form of the object; but also contain the invisible information about the insides. The models clearly provide more information about the edges, surfaces, planes and angles. The following two figures demonstrate the similarities of 'volumetric characteristic; one I saw on Singapore outdoor sculpture and the other one is a paper model that shows the volume of a bottle. Both include the 'volume' that needs to be 'seen' with a little imagination.

Volumetric outdoor display in Singapore
Volumetric bottle and plastic bottle inspired by the outdoor display

Wireframe on the display
Drawing structural objects require the understanding of shape, forms, volume and et cetera, the following figures show the example of the paper models and the drawings:
Organic objects

While seeing the object before we construct the model, we need to figure out several possible ways, and this is best to be done individually by undergoing a mental process- which involves the process of observing, identifying, extracting, imagining and visualizing. We can start formulate and ask ourselves some questions, for example 'how to make it?', 'how many planes?' 'Are there edges?' Or simply 'what do I notice?' At the same time, we could conduct an experiment to figure things out on our own. Amazingly, we start to trust our eyes and our brain. Thus, in the models making process, we see connection of every plane, we visualize the invisible structure, we identify the shape and form, and most importantly we notice what we overlook. As mentioned earlier, drawing from models is more effective in encouraging seeing and observation process. The models makers are more likely to remember and understand the structural elements because they created the paper models themselves. The approach might take more time but it is more effective and it will save time in the long run by not having them debriefed again and again.

Drawing structural objects (geometrical/ organic) could be easier if the process of seeing and observation process are promoted. After seeing, it is about visualizing the imaginative details and characteristic. Close our eyes and make a mental map; that is to visualize the planes that construct the object and its relationship with each other. We have to start being critical by asking ourselves several questions for example 'what is the thickness?', 'How many planes are there?', 'How many angles are there?', 'What are the basic shapes and basic forms of that object?' And we need to see how all parts fit together by seeing what is relevant. With a little imagination, the structure will form in our heads and amazingly, it could be ‘turn around’. We start ‘seeing’ it from all sides. As the conclusion, it is about seeing the visible and the invisible, analysing with a little imagination, and construct every plane and lines with our hands. As the Master Xun Zi, the Confucian philosopher in ancient China said to his pupils: “I hear and I forget, I see and I remember, I do and I understand”.

Reference Cited:


